CentER for Economic Research

Discussion paper

[redacted]

No. 9301

CREDIBILITY AND DURATION OF POLITICAL CONTESTS AND THE EXTENT OF RENT DISSIPATION

by Nava Kahana
and Shmuel Nitzan

January 1993

ISSN 0924-7815

CREDIBILITY AND DURATION OF POLITICAL CONTESTS AND THE EXTENT OF RENT DISSIPATION*

Nava Kahana Shmuel Nitzan

October, 1992

Department of Economics, Bar Ilan University, Ramat Gan 52900, Israel

*This paper was completed while the second author was visiting CentER for Economic Research at Tilburg University; the author is grateful to the CentER for its hospitality and support.

Abstract

Underdissipation of a contested rent in an imperfectly discriminating contest might be due to risk-aversion, a small number of contestants or public good characteristics of the rent. This paper shows how underdissipation is associated with imperfect government credibility. In particular we study the relationship between the extent of rent dissipation and the duration of the contest and government credibility. When the rent is preassigned to potential beneficiaries total rent dissipation is demonstrated to be less than 30%. We also obtain the combinations of contest duration and government credibility yielding the maximal rent-seeking outlays.

1 Introduction

This paper is concerned with the effect of incomplete government credibility and of the duration of the government ruling period on the outlays made in imperfectly discriminating rent-seeking contests, Hillman (1986). In our extended dynamic rent-seeking game the potential beneficiaries of a privately appropriable transfer attempt to influence the political allocation mechanism. This happens when the transfer is contestable, and also when the transfer is preassigned but uncertain (the government commitment credibility to award the rent during its ruling period is imperfect). In this latter situation an individual does not compete against other potential beneficiaries, but against nature trying to secure his receiving of the preassigned transfer while the government is still in office.

In imperfectly discriminating contests rent dissipation is complete when the competitors are indentical risk-neutral individuals, the number of contestants is sufficiently large and the transfer is a private good transfer, Tullock (1980). Subsequent studies have shown that the contested rent is underdissipated when the contenders are risk averse, Hillman and Katz (1984), the individuals' valuations of the prize are not identical, Hillman and Riley (1989), the contested rent has public good characteristics, Katz et al. (1990), Ursprung (1990), or when groups of individuals compete on a private good rent, Nitzan (1991). In the current study we introduce another possible source of underdissipation, viz. imperfect government credibility.

Our extended rent-seeking game is presented in the following section. Section 3 which contains the results of the equilibrium analysis is divided into four subsections. In the first one we provide the conditions ensuring that the political contest is effective, namely, that the players expand resources in trying to win the rent. In the second subsection we show that the rent is underdissipated. The third part contains the compartive statics results. In the fourth subsection we study the case of preassigned or earmarked rents where the competition element is neutralized. The extent of rent dissipation in this special case is compared to that of the general case. We also derive a limit to underdissipation when the rents are preassigned. The conclusions of our study are presented in the final section.

2 The Framework

Consider n risk neutral identical individuals confronting the opportunity of winning a prespecified continuous transfer S. This transfer, which is allocated by the ruling government, is referred to as a contestable rent. The government stays in office for a fixed period T. In our imperfectly discriminating contest the political process cannot discriminate among the competing individuals to designate a winner at a certain time with certainty, but rather the outcome of the contest is the assignment to each individual of a probability that he wins the contest at time t, $t \in [0, T]$. An individual winning the contest at time t secures the continuous transfer S from the winning time until the end of the government ruling period, i.e., his total gain will be equal to $S[T - t]$.

The probability that an individual is the successful contender at time t depends on his and the other competitors' continuous rent-seeking outlays $x_j, j = 1, \ldots, n$ and on the parameter δ, $\delta > 0$, representing the credibility of the government or, alternatively, the determination of the government to respect its commitment and actually make the promised transfer. Each player in our game competes against the other contenders as well as against time. He may lose the game and irretrievably lose the outlays which he made in the attempt to influence the outcome of the contest in his favor either because some other contender wins the contest or because time is run out and nobody wins the contest.

The individual enforceable outlays commitment is made at $t = 0$. This implies that his total rent-seeking outlays are in fact equal to Tx_i, regardless of whether he or any other contender wins the contest at some time t, $t < T$. Note that in our model the individual's rent is uncertain ranging between 0 and ST and that it is possible that nobody wins the contest. The probability that individual i wins the contest in the immediate next instant, given that no one won the contest yet, is assumed to be proportional to x_i and δ. Formally, let t_i denote the time individual i wins the contest. Then

$$\text{prob } \{t_i \in [t, t + dt] : \ t_j > t_i, \ j \neq i\} = \delta x_i dt, \quad i, j = 1, \ldots, n.$$

It can be shown that given the above conditional probability, the density function of success by individual i to win the contest at time t is $e^{-\delta X t} \delta x_i$ and the density function of failure by individual i to win the contest at time t is $e^{-\delta X t}\delta X_{-i}$, where $X = \sum_{i=1}^{n} x_i$ and $X_{-i} = \sum_{j\neq i} x_j$. Given the individual outlay commitments $(x_1, \ldots, x_n)$, the expected time of winning the contest is given by

$$E(t) = \int_0^\infty t\, e^{-\delta X t}\delta X dt = \frac{1}{\delta X}.^{1}$$

Note that $\frac{1}{\delta}$ can be interpreted as a measure for the discredibility of the government or of the degree of difficulty of winning the contest.

Given the individual endowed wealth yT and the n individuals' rent-seeking outlays $(x_1, \ldots, x_n)$, the expected payoff of individual i during the government ruling period $[0, T]$ is given by R,[2]

$$R = \int_0^T S(T-t)e^{-\delta X t}\delta x_i dt + (y - x_i)T = \frac{x_i}{X}\int_0^T S(T-t)e^{-\delta X t}\delta X dt + (y - x_i)T$$

$$= \frac{x_i}{X} SB(X) + (y - x_i)T \quad (1)$$

where $B(X) = [T - \frac{1}{\delta X}(1 - e^{-\delta X T})]$.

$(1 - e^{-\delta X T})$ is the probability that the contest is won by some individual before T.[3] $\frac{1}{\delta X}$ is the expected winning time. The expected time of winning the contest conditional on the termination of the contest before T is therefore equal to $\frac{1}{\delta X}(1 - e^{-\delta X T})$. In turn, $B(X)$ is the corresponding conditional expected duration of the period during which the transfer S is received and $SB(X)$ is the expected total rent (transfer) conditional on there being a winner in the contest.

Interestingly, Tullock's (1980) rent-seeking contest is obtained as a special case of our model when there is no uncertainty regarding the government's ability to stand behind its commitment. Specifically, when $\delta \to \infty$ the total transfer is equal to ST and

$$R = \frac{x_i}{X} ST + (y - x_i)T \quad (2)$$

which is precisely the payoff function of agent i in Tullock's game. In such a case our dynamic contest reduces of course to a static one.

In the rent-seeking literature the individual is assumed to compete against other agents and therefore the number of contenders n is at least 2. In our extended model the contest is viable even when $n = 1$. Furthermore, this latter extreme case is not so peculiar since in many political-economic environments the government transfer pattern is strictly constrained. Often, politicians do not have discretion regarding the manner in which they can allocate their available budgets. In particular, under earmarking of the available budgets multi-agent contests are not likely to arise. Still, the candidate recipient of the budget may need to "compete" and spend resources in order to secure his winning of the rent, i.e., receive the designated budget while the government is still in office. The special case of a single-member contest thus merits attention and is separately analyzed in the following section. We are also concerned with the comparison of the outcome of an n-member contest on budget of size S with the outcome of n single-member contests on the same total budget where in each single-member contest the individual can win a rent equal to $\frac{S}{n}$.

3 Results

A. Effective Contests

In a pure strategy Nash equilibrium of our rent-seeking game, $(x_1^*, \ldots, x_n^*)$, each individual i solves the problem:

$$\max_{x_i} \; R(x_1, \ldots, x_n;\; \delta, S, T) = R\;(x_i, x_{-i}; \delta, S, T) \tag{3}$$

$$\text{s.t } 0 \leq x_i \leq y \text{ and } x_{-i} = x_{-i}^*.$$

In a symmetric Nash equilibrium $x_1^* = x_2^* = \ldots = x_n^* = x^*$. In such equilibrium the players may prefer to be passive and avoid spending any resources. That is, it is possible that the contest is ineffective, i.e., $x^* = 0$. In the following proposition we establish that this possibility is ruled out when the government is in office a sufficiently long period T, when its credibility δ is sufficiently high or when the contestable rent S is large enough.

Proposition 1 *:* $x^* > 0$ *if* $T > \frac{2}{\delta S}$.

Proof: By the second order condition for x^* to be a solution of (3), $\frac{\partial^2 R}{\partial x_i^2} < 0$. To prove the proposition, we will show that $T > \frac{2}{\delta S}$ implies that $\lim_{x \to 0} \frac{\partial R}{\partial x_i} > 0$.

$$\frac{\partial R}{\partial x_i} = \frac{SX_{-i}}{X}\frac{B(X)}{X} + \frac{Sx_i}{X}\frac{\partial B(X)}{\partial X} - T \tag{4}$$

where

$$\frac{B(X)}{X} = \frac{T}{X} + \frac{e^{-\delta XT}}{\delta X^2} - \frac{1}{\delta X^2} \tag{5}$$

and

$$\frac{\partial B(X)}{\partial X} = \frac{1}{\delta X^2} - \frac{Te^{-\delta XT}}{X} - \frac{e^{-\delta XT}}{\delta X^2}. \tag{6}$$

In a symmetric Nash equilibrium then,

$$\frac{\partial R}{\partial x_i}\Big|_{x_1=\ldots=x_n=x} = \frac{\partial R}{\partial x} = \frac{(n-1)}{n}\frac{SB(X)}{X} + \frac{S}{n}\frac{\partial B}{\partial X} - T. \tag{7}$$

By l'Hospital rule,

$$\begin{aligned}\lim_{X\to 0}\frac{B(X)}{X} &= \lim_{X\to 0}\frac{TX\delta + e^{-\delta XT} - 1}{\delta X^2} = \lim_{X\to 0}\frac{T\delta - \delta Te^{-\delta XT}}{2\delta X} \\ &= \lim_{X\to 0}\frac{\delta^2 T^2 e^{-\delta XT}}{2\delta} = \frac{\delta T^2}{2}.\end{aligned} \tag{8}$$

$$\begin{aligned}\lim_{X\to 0}\frac{\partial B}{\partial X} &= \lim_{X\to 0}\frac{1 - \delta XTe^{-\delta XT} - e^{-\delta XT}}{\delta X^2} \\ &= \lim_{X\to 0}\frac{-\delta Te^{-\delta XT} + \delta^2T^2Xe^{-\delta XT} + \delta Te^{-\delta XT}}{2\delta X} = \frac{\delta T^2}{2}.\end{aligned} \tag{9}$$

Hence,

$$\lim_{x\to 0}\frac{\partial R}{\partial x} = \frac{S\delta T^2}{2} - T > 0 \Leftrightarrow T > \frac{2}{\delta S}. \tag{10}$$

□

B. Incomplete Rent Dissipation

An interior equilibrium, $(x^*, \ldots, x^*)$, $0 < x^* < y$, is characterized by the following equation:

$$\frac{\partial R}{\partial x} = \frac{(n-1)}{n}\frac{SB(X^*)}{X^*} + \frac{S}{n}\frac{\partial B(X^*)}{\partial X} - T = 0. \tag{11}$$

The total rent-seeking outlays in such an equilibrium is equal to $X^* = nx^*$. In our dynamic setting the uncertainty regarding the commitment of the government entails underdissipation of the contested rent. That is,

Proposition 2 : $X^* < S$.

Proof: We show below that at $X = S$, $\frac{\partial R}{\partial x} < 0$. By the second order condition, $\frac{\partial^2 R}{\partial x^2} < 0$ which implies that $X^* < S$.

For $X = S$,

$$\frac{\partial R}{\partial x} = \frac{n-1}{n}\left(T - \frac{1}{\delta S} + \frac{e^{-\delta ST}}{\delta S}\right) + \frac{1}{n}\left(\frac{1}{\delta S} - Te^{-\delta ST} - \frac{e^{-\delta ST}}{\delta S}\right) - T. \tag{12}$$

By proposition 1, $X^* > 0$ implies that $T > \frac{2}{\delta S} > \frac{1}{\delta S}$. Note that $0 < e^{-\delta ST} < 1$ and therefore, $\frac{e^{-\delta ST}}{\delta S} < \frac{1}{\delta S}$. Hence,

$$\frac{\partial R}{\partial x} < \frac{n-1}{n}T + \frac{1}{n}T - T + \frac{n-1}{n}\left(\frac{1}{\delta S} - \frac{1}{\delta S}\right) - \frac{Te^{-\delta ST}}{n} - \frac{e^{-\delta ST}}{n\delta S} < 0. \tag{13}$$

□

Incomplete credibility of the government generates incomplete rent dissipation. It is also detrimental to the individual welfare; The fact that $e^{-\delta ST} < 1$ imply that the individual utility is reduced relative to the case of complete government credibility (compare (1) and (2)).

C. Comparative Statics

In the following proposition we obtain the intuitive result that total rent-seeking outlays are positively related to the size of the contestable rent and to the credibility of the government. More surprisingly, the contest duration effect is also unambiguous; for $n \geq 2$ the extent of rent dissipation is positively related to the duration of the contest.

Proposition 3 : $(i)\frac{\partial X^*}{\partial S} > 0 \;\; (ii)\frac{\partial X^*}{\partial \delta} > 0 \;\; (iii)\frac{\partial X^*}{\partial T} > 0.$

Proof:

$$\text{(i)}\ \frac{\partial X^{*}}{\partial S}=\frac{-\left[\frac{n-1}{n}\frac{B(X^{*})}{X^{*}}+\frac{1}{n}\frac{\partial B(X^{*})}{\partial X}\right]}{\frac{\partial^2 R}{\partial X^2}}. \tag{14}$$

Substituting the equilibrium condition (11) into (14) we obtain:

$$\frac{\partial X^{*}}{\partial S}=\frac{-T}{S\frac{\partial^2 R}{\partial x^2}}>0. \tag{15}$$

$$\begin{aligned}
\text{(ii)}\ \frac{\partial X^{*}}{\partial \delta} &= \frac{-\left\{\frac{n-1}{n}S\left[-\frac{e^{-\delta X^{*}T}}{\delta^2 X^{*2}}-\frac{Te^{-\delta X^{*}T}}{\delta X^{*}}+\frac{1}{\delta^2 X^{*2}}\right]+\frac{S}{n}\left[-\frac{1}{\delta^2 X^{*2}}+T^2e^{-\delta X^{*}T}+\frac{e^{-\delta X^{*}T}}{\delta^2 X^{*2}}+\frac{Te^{-\delta X^{*}T}}{\delta X^{*}}\right]\right\}}{\frac{\partial^2 R}{\partial x^2}} \\
&= \frac{-\left\{\left(\frac{n-2}{n}\right)S\left[\frac{1}{\delta^2 X^{*2}}-\frac{Te^{-\delta X^{*}T}}{\delta X^{*}}-\frac{e^{-\delta X^{*}T}}{\delta^2 X^{*2}}\right]+S\frac{T^2e^{-\delta X^{*}T}}{n}\right\}}{\frac{\partial^2 R}{\partial x^2}} \\
&= \frac{-\left\{\frac{n-2}{n}\frac{S}{\delta}\frac{\partial B(X^{*})}{\partial X}+\frac{ST^2e^{-\delta X^{*}T}}{n}\right\}}{\frac{\partial^2 R}{\partial x^2}}.
\end{aligned}$$

Denoting $\frac{\partial B}{\partial X}$ by $G(T)$, one can readily verify (see (6)) that $G(0)=0$ and $\frac{\partial G}{\partial T}=\delta Te^{-\delta XT}>0$. Hence, for $T>0, G(T)=\frac{\partial B}{\partial X}>0$ which implies that, for $n\geq 2$, $\frac{\partial X^{*}}{\partial \delta}>0$.

$$\text{(iii)}\frac{\partial X^{*}}{\partial T}=\frac{\left\{\frac{n-1}{n}S\left[\frac{1}{X^{*}}-\frac{e^{-\delta X^{*}T}}{X^{*}}\right]+\frac{S}{n}\delta Te^{-\delta X^{*}T}-1\right\}}{-\frac{\partial^2 R}{\partial x^2}}, \tag{16}$$

Substituting the equilibrium condition (11) into (16) we obtain:

$$\frac{\partial X^{*}}{\partial T}=\frac{\frac{n-2}{n}\frac{S}{T}\frac{\partial B(X^{*})}{\partial X}+\frac{S}{n}\delta Te^{-\delta X^{*}T}}{-\frac{\partial^2 R}{\partial x^2}}. \tag{17}$$

For $n\geq 2$ and given that $\frac{\partial B}{\partial X}>0$, $\frac{\partial X^{*}}{\partial T}>0$. □

A longer contest implies both an increased prize and higher chances that the contest is won. The increased expected reward stimulates higher rent-seeking outlays. However, the increased likelihood of success has two contrasting effects on X^{*}. On the one hand, the "competition" effect (see the first term in the nominator of (16)) induces the players to intensify their efforts in attempting to win the contest. On the other hand, when the competition effect is disregarded, a longer contest implies that time is working harder for the individual player and for a sufficiently large T, despite the income effect, an increase in T may reduce the individual incentives to spend resources (see the second term in the nominator of (16)). Under a viable competition, $n \geq 2$, the former positive effect is dominant ensuring the unambiguous relationship between the duration of the contest and the extent of rent dissipation.

D. Preassigned Rents: The Single Player Case

Let $n = 1$. In this case of minimal competition the politicians do not have discretion regarding the manner in which they can allocate their budget. Rather the budget is earmarked. The contest, which can now be interpreted as a game against nature, is still viable since the potential recipient of the budget can affect his chance of receiving the rent. To compare the extent of rent dissipation under the multi-member rent-seeking contest, $n \geq 2$, and the single-member competition against time, suppose that in the latter case each individual is allocated a budget which is equal to $s = \frac{S}{n}$. An optimal rent-seeking outlay x_0 is now characterized by the following condition:

$$\frac{\partial R}{\partial x} = s\left[\frac{1}{\delta x_0^2} - \frac{Te^{-\delta x_0 T}}{x_0} - \frac{e^{-\delta x_0 T}}{\delta x_0^2}\right] - T = 0. \tag{18}$$

It turns out that the total rent-seeking outlays in an n-member contest, $n \geq 2$, are larger than the resources expanded by n individuals who separately compete just against the running time in attempting to receive their equal share $\frac{S}{n}$ in the total budget distributed.

Proposition 4 : $x_0 < x^*$.

Proof: Let $Z(n,x) = (n-1)\frac{B}{X} + \frac{\partial B}{\partial X}$.
The multi-player equilibrium condition (11) can therefore be rewritten as:

$$\frac{\partial R}{\partial x}\Big|_{n\geq 2} = \frac{S}{n}Z(n,x) - T = 0 \tag{19}$$

and the single-player equilibrium condition (18) can be written as:

$$\frac{\partial R}{\partial x}\Big|_{n=1} = \frac{S}{n}Z(1,x) - T = 0. \tag{20}$$

By Lemma 4.1 which is proven below, $Z(n,x)$ is increasing in n. Hence, for $n \geq 2$, $Z(n,x) > Z(1,x)$. This implies that for $x = x_0$, $\frac{\partial R}{\partial x}\big|_{n\geq 2} > 0$. By the second order condition, $\frac{\partial^2 R}{\partial x^2}|_{n\geq 2} < 0$, which means that $x_0 < x^*$.

Lemma 4.1:
$$\frac{\partial Z(n,x)}{\partial n} > 0.$$

Proof:
$$\begin{aligned}\frac{\partial Z(n,x)}{\partial n} &= \frac{B(X)}{X} + \frac{(n-1)\left(\frac{\partial B}{\partial X}X - B(X)\right)x}{X^2} + \frac{\partial^2 B}{\partial X^2}x \\ &= \frac{B(X)}{X} + \frac{n-1}{n}\left(\frac{\partial B}{\partial X} - \frac{B(X)}{X}\right) + \frac{X}{n}\frac{\partial^2 B}{\partial X^2} \\ &= \frac{1}{n}\left[\frac{B(X)}{X} + X\frac{\partial^2 B}{\partial X^2}\right] + \frac{n-1}{n}\frac{\partial B}{\partial X}.\end{aligned}$$

We proved earlier that $\frac{\partial B}{\partial X} > 0$. We therefore complete the proof of the lemma by showing that $\left[\frac{B}{X} + X\frac{\partial^2 B}{\partial X^2}\right] > 0$.

$$\frac{B}{X} + X\frac{\partial^2 B}{\partial X^2} = \frac{1}{X}\left(T - \frac{3}{\delta X} + \frac{3e^{-\delta XT}}{\delta X} + 2Te^{-\delta XT} + \delta XT^2 e^{-\delta XT}\right) = \frac{1}{X}A(T).$$

Note that $A(0) = 0$ and $\frac{\partial A}{\partial T} = 1 - e^{-y} - y^2 e^{-y} = D(y)$ where $y = \delta XT$. Note that $D(0) = 0$ and $\frac{\partial D}{\partial y} = (1-y)^2 e^{-y} \geq 0$ ($\frac{\partial D}{\partial y} = 0$ for $y = 1$). Hence, $\frac{\partial A}{\partial T} > 0$ and $A(T) > 0$ for $T \neq 0$. □

The analysis of the effect of a change in the duration of the contest on the rent-seeking outlays does not yield an unambiguous result as in Proposition 3(iii). This is due to the fact that the positive "competition effect" vanishes (see the first term in the nominator of (16)). In the single-member contest, $\frac{\partial x_0}{\partial T} = \frac{s\delta Te^{-\delta x_0 T} - 1}{-\frac{\partial^2 R}{\partial x^2}}$. By substituting (18) into $\frac{\partial x_0}{\partial T}$ we obtain that $\frac{\partial x_0}{\partial T} = \frac{H(k)}{-\frac{\partial^2 R}{\partial x^2}}$ where $k = \delta x_0 T$ and $H(k) = -1 + k^2 e^{-k} + e^{-k} + ke^{-k}$.

The function $H(k)$ satisfies the following properties:

(i) $H(0) = 0$.

(ii) $\lim_{k\to\infty} H(k) = -1$.

(iii) $H'(k) = k(1-k)e^{-k}$ and therefore $H'(k) \gtrless 0$ if $k \lessgtr 1$.

Hence, there exists $k_0 > 1$ such that $H(k) > 0$ for $0 < k < k_0$ and $H(k) < 0$ for $k > k_0$. Since x_o is a function of T, one needs to check that $k = \delta x_0 T$ is not greater or smaller than k_0 for any $T > 0$. It is clear from the sequel that these two possibilities do not occur.

That is, for any given δ there exists T^* such that $\delta x_o T^* = k_0$, $\delta x_0 T < k_0$ for $T < T^*$ and $\delta x_0 T > k_0$ for $T > T^*$. In turn, for $T < T^*$, $\frac{\partial x_0}{\partial T} > 0$ and for $T > T^*$, $\frac{\partial x_0}{\partial T} < 0$. Clearly, this T^* maximizes the individual rent-seeking outlays. Our next natural question is what is the maximal degree of rent dissipation corresponding to T^*.

Clearly, this maximal level constitutes a limit to the extent of rent dissipation in the constrained environment where rent recipients compete against time but not against other recipients. The following proposition provides the answer to the above question.

Proposition 5 : *Given δ and S,* $\text{Max}_T \frac{x_o(T;s,\delta)}{s} = \frac{n x_0(T^*;s,\delta)}{S}$ *= 0.298.*

Proof: The government ruling period $[0, T^*]$ maximizing the extent of rent dissipation given s and δ satisfies the following first order condition:

$$\frac{\partial x_0}{\partial T} = \frac{s\delta T e^{-\delta x_0 T} - 1}{-\frac{\partial^2 R}{\partial x^2}} = 0 \tag{21}$$

or, equivalently,

$$e^{-cx_0/s} = \frac{1}{c} \quad \text{where} \quad c = s\delta T, \tag{22}$$

or

$$\frac{x_0}{s} = \frac{ln\, c}{c}. \tag{23}$$

To solve for c, let us substitute (23) into (18), the condition characterizing the optimal rent-seeking outlay x_0, to obtain

$$\frac{1}{ln^2 c} - \frac{1}{ln\, c} e^{-ln c} - \frac{1}{ln^2 c} e^{-ln\, c} = \frac{1}{c}. \tag{24}$$

Let $y = ln\, c$ and so, $c = e^y$. (24) can then be rewritten as follows:

$$e^y = y^2 + y + 1. \tag{25}$$

The solution of (25) is given by $y = 1.791$. By (23), $\frac{x_0(T^*;s,\delta)}{s} = \frac{ln\, 6}{6}$ =0.298. □

A government interested in the maximization of rent-seeking outlays has an optimal contest duration which is given by $T^* = \frac{c}{s\delta} = \frac{e^y}{s\delta} = \frac{6}{s\delta}$. Alternatively, when T is a given parameter, such a government has an optimal credibility level which is equal to $\delta^* = \frac{6}{sT}$. This implies that the more credible the government, the shorter its preferred ruling time. And the longer the ruling period, the lower its preferred level of credibility. In any event, by Proposition 5, the maximal extent of rent dissipation is invariant to the level of the parameters and to whether the government controls T or δ.

4 Conclusions

In our simple model of rent seeking under uncertainty the identical risk-neutral potential beneficiaries of the rent recognize that the government is not perfectly credible and thus may not stand behind its commitment and actually transfer the promised rent. If government credibility δ is sufficiently low, the period it is ruling $[0, T]$ is sufficiently short or the rent S is sufficiently small, the potential beneficiaries have no incentive to expand resources in attempting to win the rent (Proposition 1). In an interior symmetric Nash equilibrium the rent is underdissipated (Proposition 2). The extent of rent dissipation is positively related to the size of the rent. If the number of contenders is at least two, it is also positively related to the contest duration and to the government credibility level (Proposition 3). When the rents or income transfers are preassigned to designated beneficiaries, competiton among players is neutralized. That is, each potential beneficiary is the single player in a game against nature. The extent of rent dissipation in an n-member contest on S, $n \geq 2$, is larger than the extent of rent dissipation in an environment where n individuals independently compete just against nature in attempting to win their designated rent which is equal to $\frac{S}{n}$ (Proposition 4). In this latter case the extent of rent dissipation is no longer always positively related to the government ruling period or to its credibility. It turns out that there exists a ruling period T^* which maximizes the extent of rent dissipation. The maximal rent dissipation is equal to 0.298 and it is invariant to the parameters of the game (Proposition 5).

References

Hillman, A.L. (1989), *The Political Economy of Protection*, London: Harwood Academic Publishers.

Hillman, A.L. and E. Katz (1984), "Risk-averse rent seekers and the social cost of monopoly power," *Economic Journal*, 94, 104-110.

Hillman, A.L. and J.G. Riley (1989), "Politically contestable rents and transfers," *Economics and Politics*, 3, 17-39.

Katz, E., S. Nitzan and J. Rosenberg (1990), "Rent seeking for pure public goods," *Public Choice*, 65, 49-60.

Nitzan, S. (1991), "Collective rent dissipation," *Economic Journal*, 101, 1522-1534.

Tullock, G. (1980), "Efficient rent seeking," in J.M. Buchanan, R.D. Tollison and G. Tullock (eds.), *Toward A Theory of Rent-Seeking Society*, College Station, Texas A& M, University Press, 3-15.

Ursprung, H.W. (1990), "Public goods, rent dissipation and candidate competition," *Economics and Politics*, 2, 115-132.

Footnotes

1. Notice that

$$\frac{\partial(e^{-\delta X t}\delta x_i)}{\partial \delta} = e^{-\delta X t}x_i(1-\delta X t)\overset{\geq}{\underset{<}{=}}0 \Leftrightarrow t\overset{\leq}{\underset{>}{=}}\frac{1}{\delta X} = E(t).$$

2. For simplicity we assume that the discount factor is equal to zero. This assumption has no effect on the insight of our results.

3. Let $F(t, x_i)$ denote the cumulative distribution of success by individual i to win the contest by time t given that his rent-seeking outlay is x_i. Then, his conditional probability to win the contest at time t, is:

$$\frac{F'}{1-F} = \delta x_i.$$

By integration we obtain:

$$-ln(1-F) = \delta x_i t.$$

Hence,

$$1-F = e^{-\delta x_i t}.$$

The probability that by t no one wins the contest is given by $\Pi_{i=1}^{n}(1-F(t,x_i)) = e^{-\delta \sum x_i t} = e^{-\delta X t}$, which means that the probability that the contest is won by some individual before T is equal to $(1-e^{-\delta X T})$.

Discussion Paper Series, CentER, Tilburg University, The Netherlands:

(For previous papers please consult previous discussion papers.)

No.	Author(s)	Title
9131	K. Binmore and L. Samuelson	Evolutionary Stability in Repeated Games Played by Finite Automata
9132	L. Samuelson and J. Zhang	Evolutionary Stability in Asymmetric Games
9133	J. Greenberg and S. Weber	Stable Coalition Structures with Uni-dimensional Set of Alternatives
9134	F. de Jong and F. van der Ploeg	Seigniorage, Taxes, Government Debt and the EMS
9135	E. Bomhoff	Between Price Reform and Privatization - Eastern Europe in Transition
9136	H. Bester and E. Petrakis	The Incentives for Cost Reduction in a Differentiated Industry
9137	L. Mirman, L. Samuelson and E. Schlee	Strategic Information Manipulation in Duopolies
9138	C. Dang	The D^*_2-Triangulation for Continuous Deformation Algorithms to Compute Solutions of Nonlinear Equations
9139	A. de Zeeuw	Comment on "Nash and Stackelberg Solutions in a Differential Game Model of Capitalism"
9140	B. Lockwood	Border Controls and Tax Competition in a Customs Union
9141	C. Fershtman and A. de Zeeuw	Capital Accumulation and Entry Deterrence: A Clarifying Note
9142	J.D. Angrist and G.W. Imbens	Sources of Identifying Information in Evaluation Models
9143	A.K. Bera and A. Ullah	Rao's Score Test in Econometrics
9144	B. Melenberg and A. van Soest	Parametric and Semi-Parametric Modelling of Vacation Expenditures
9145	G. Imbens and T. Lancaster	Efficient Estimation and Stratified Sampling
9146	Th. van de Klundert and S. Smulders	Reconstructing Growth Theory: A Survey
9147	J. Greenberg	On the Sensitivity of Von Neuman and Morgenstern Abstract Stable Sets: The Stable and the Individual Stable Bargaining Set

No.	Author(s)	Title
9148	S. van Wijnbergen	Trade Reform, Policy Uncertainty and the Current Account: A Non-Expected Utility Approach
9149	S. van Wijnbergen	Intertemporal Speculation, Shortages and the Political Economy of Price Reform
9150	G. Koop and M.F.J. Steel	A Decision Theoretic Analysis of the Unit Root Hypothesis Using Mixtures of Elliptical Models
9151	A.P. Barten	Consumer Allocation Models: Choice of Functional Form
9152	R.T. Baillie, T. Bollerslev and M.R. Redfearn	Bear Squeezes, Volatility Spillovers and Speculative Attacks in the Hyperinflation 1920s Foreign Exchange
9153	M.F.J. Steel	Bayesian Inference in Time Series
9154	A.K. Bera and S. Lee	Information Matrix Test, Parameter Heterogeneity and ARCH: A Synthesis
9155	F. de Jong	A Univariate Analysis of EMS Exchange Rates Using a Target
9156	B. le Blanc	Economies in Transition
9157	A.J.J. Talman Simplotope	Intersection Theorems on the Unit Simplex and the
9158	H. Bester	A Model of Price Advertising and Sales
9159	A. Özcam, G. Judge, A. Bera and T. Yancey	The Risk Properties of a Pre-Test Estimator for Zellner's Seemingly Unrelated Regression Model
9160	R.M.W.J. Beetsma	Bands and Statistical Properties of EMS Exchange Rates: A Monte Carlo Investigation of Three Target Zone Models Zone Model
9161	A.M. Lejour and H.A.A. Verbon	Centralized and Decentralized Decision Making on Social Insurance in an Integrated Market Multilateral Institutions
9162	S. Bhattacharya	Sovereign Debt, Creditor-Country Governments, and
9163	H. Bester, A. de Palma, W. Leininger, E.-L. von Thadden and J. Thomas	The Missing Equilibria in Hotelling's Location Game
9164	J. Greenberg	The Stable Value
9165	Q.H. Vuong and W. Wang	Selecting Estimated Models Using Chi-Square Statistics
9166	D.O. Stahl II	Evolution of $Smart_n$ Players

No.	Author(s)	Title
9167	D.O. Stahl II	Strategic Advertising and Pricing with Sequential Buyer Search
9168	T.E. Nijman and F.C. Palm	Recent Developments in Modeling Volatility in Financial Data
9169	G. Asheim	Individual and Collective Time Consistency
9170	H. Carlsson and E. van Damme	Equilibrium Selection in Stag Hunt Games
9201	M. Verbeek and Th. Nijman	Minimum MSE Estimation of a Regression Model with Fixed Effects from a Series of Cross Sections
9202	E. Bomhoff	Monetary Policy and Inflation
9203	J. Quiggin and P. Wakker	The Axiomatic Basis of Anticipated Utility; A Clarification
9204	Th. van de Klundert and S. Smulders	Strategies for Growth in a Macroeconomic Setting
9205	E. Siandra	Money and Specialization in Production
9206	W. Härdle	Applied Nonparametric Models
9207	M. Verbeek and Th. Nijman	Incomplete Panels and Selection Bias: A Survey
9208	W. Härdle and A.B. Tsybakov	How Sensitive Are Average Derivatives?
9209	S. Albæk and P.B. Overgaard	Upstream Pricing and Advertising Signal Downstream Demand
9210	M. Cripps and J. Thomas	Reputation and Commitment in Two-Person Repeated Games
9211	S. Albæk	Endogenous Timing in a Game with Incomplete Information
9212	T.J.A. Storcken and P.H.M. Ruys	Extensions of Choice Behaviour
9213	R.M.W.J. Beetsma and F. van der Ploeg	Exchange Rate Bands and Optimal Monetary Accommodation under a Dirty Float
9214	A. van Soest	Discrete Choice Models of Family Labour Supply
9215	W. Güth and K. Ritzberger	On Durable Goods Monopolies and the (Anti-) Coase-Conjecture
9216	A. Simonovits	Indexation of Pensions in Hungary: A Simple Cohort Model
9217	J.-L. Ferreira, I. Gilboa and M. Maschler	Credible Equilibria in Games with Utilities Changing during the Play

No.	Author(s)	Title
9218	P. Borm, H. Keiding, R. Mclean, S. Oortwijn and S. Tijs	The Compromise Value for NTU-Games
9219	J.L. Horowitz and W. Härdle	Testing a Parametric Model against a Semiparametric Alternative
9220	A.L. Bovenberg	Investment-Promoting Policies in Open Economies: The Importance of Intergenerational and International Distributional Effects
9221	S. Smulders and Th. van de Klundert	Monopolistic Competition, Product Variety and Growth: Chamberlin vs. Schumpeter
9222	H. Bester and E. Petrakis	Price Competition and Advertising in Oligopoly
9223	A. van den Nouweland, M. Maschler and S. Tijs	Monotonic Games are Spanning Network Games
9224	H. Suehiro	A "Mistaken Theories" Refinement
9225	H. Suehiro	Robust Selection of Equilibria
9226	D. Friedman	Economically Applicable Evolutionary Games
9227	E. Bomhoff	Four Econometric Fashions and the Kalman Filter Alternative - A Simulation Study
9228	P. Borm, G.-J. Otten and H. Peters	Core Implementation in Modified Strong and Coalition Proof Nash Equilibria
9229	H.G. Bloemen and A. Kapteyn	The Joint Estimation of a Non-Linear Labour Supply Function and a Wage Equation Using Simulated Response Probabilities
9230	R. Beetsma and F. van der Ploeg	Does Inequality Cause Inflation? - The Political Economy of Inflation, Taxation and Government Debt
9231	G. Almekinders and S. Eijffinger	Daily Bundesbank and Federal Reserve Interventions - Do they Affect the Level and Unexpected Volatility of the DM/\$-Rate?
9232	F. Vella and M. Verbeek	Estimating the Impact of Endogenous Union Choice on Wages Using Panel Data
9233	P. de Bijl and S. Goyal	Technological Change in Markets with Network Externalities
9234	J. Angrist and G. Imbens	Average Causal Response with Variable Treatment Intensity
9235	L. Meijdam, M. van de Ven and H. Verbon	Strategic Decision Making and the Dynamics of Government Debt
9236	H. Houba and A. de Zeeuw	Strategic Bargaining for the Control of a Dynamic System in State-Space Form

No.	Author(s)	Title
9237	A. Cameron and P. Trivedi	Tests of Independence in Parametric Models: With Applications and Illustrations
9238	J.-S. Pischke	Individual Income, Incomplete Information, and Aggregate Consumption
9239	H. Bloemen	A Model of Labour Supply with Job Offer Restrictions
9240	F. Drost and Th. Nijman	Temporal Aggregation of GARCH Processes
9241	R. Gilles, P. Ruys and J. Shou	Coalition Formation in Large Network Economies
9242	P. Kort	The Effects of Marketable Pollution Permits on the Firm's Optimal Investment Policies
9243	A.L. Bovenberg and F. van der Ploeg	Environmental Policy, Public Finance and the Labour Market in a Second-Best World
9244	W.G. Gale and J.K. Scholz	IRAs and Household Saving
9245	A. Bera and P. Ng	Robust Tests for Heteroskedasticity and Autocorrelation Using Score Function
9246	R.T. Baillie, C.F. Chung and M.A. Tieslau	The Long Memory and Variability of Inflation: A Reappraisal of the Friedman Hypothesis
9247	M.A. Tieslau, P. Schmidt and R.T. Baillie	A Generalized Method of Moments Estimator for Long-Memory Processes
9248	K. Wärneryd	Partisanship as Information
9249	H. Huizinga	The Welfare Effects of Individual Retirement Accounts
9250	H.G. Bloemen	Job Search Theory, Labour Supply and Unemployment Duration
9251	S. Eijffinger and E. Schaling	Central Bank Independence: Searching for the Philosophers' Stone
9252	A.L. Bovenberg and R.A. de Mooij	Environmental Taxation and Labor-Market Distortions
9253	A. Lusardi	Permanent Income, Current Income and Consumption: Evidence from Panel Data
9254	R. Beetsma	Imperfect Credibility of the Band and Risk Premia in the European Monetary System
9301	N. Kahana and S. Nitzan	Credibility and Duration of Political Contests and the Extent of Rent Dissipation

P.O. BOX 90153. 5000 LE TILBURG, THE NETHERLAND